Mathematics Toolkit: Grade 8 Objective 4.B.1.b

Standard 4.0 Knowledge of Statistics

Topic B. Data Analysis

Indicator 1. Analyze data

Objective b. Interpret box-and-whisker plots

Assessment Limits:

Use minimum, first (lower) quartile, median (middle quartile), third (upper) quartile, or maximum and whole numbers (0 – 100)

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Objective 4.B.1.b Tools

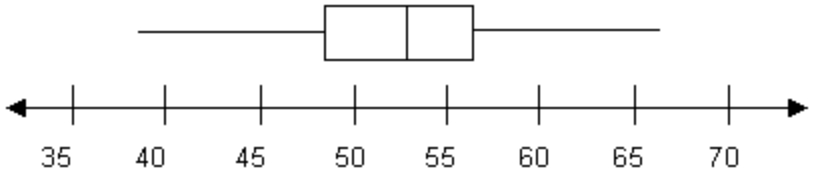
Higher Order Thinking Skills

Mathematics Grade 8 Objective 4.B.1.b Assessment Limit 1

Question

The following box-and-whisker plot represents the average monthly rainfall in millimeters for the Australian Capital Territory (ACT). Source: http://www.about-australia.com/actweat.htm

Average Monthly Rainfall for the ACT (in millimeters)



Level 1: Knowledge/Comprehension

What are estimates of the median and range for the data set?

> Sample correct response: The median of the data set is about 53 millimeters and the range of the data set is about 30 millimeters.

Level 2: Application/Analysis

In the box and whisker plot above: The minimum is 38, the lower quartile is 49, the median is 53.5, the upper quartile is 56.5 and the maximum is 67.

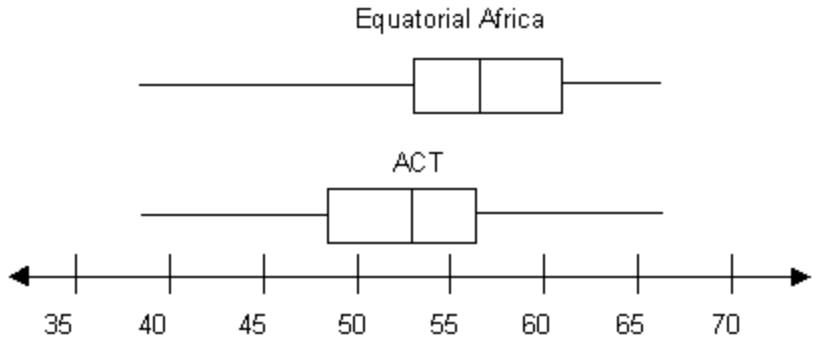
At least what percent of the months have more than 49 millimeters of rainfall?

> Sample correct response: Since the lower quartile of the data set is 49, at least 75% of the data is greater than 49 millimeters. Therefore, at least 75% of the 12 months, or 9 months, have more than 49 millimeters of rainfall.

Level 3: Synthesis/Evaluation

A box-and-whisker plot for the Average Monthly Rainfall for the Wetland Region in Equatorial Africa has been drawn below on the same scale as the Average Monthly Rainfall for the Australian Capital Territory (ACT). The lower quartile for the Average Monthly Rainfall for the Wetland Region in Equatorial Africa is 53.5 and its median is 56.5. Compare the amount of average monthly rainfall shown for the Wetland Region in Equatorial Africa to the average monthly rainfall for the ACT in terms of percents or fractions.

Average Monthly Rainfall (in millimeters)

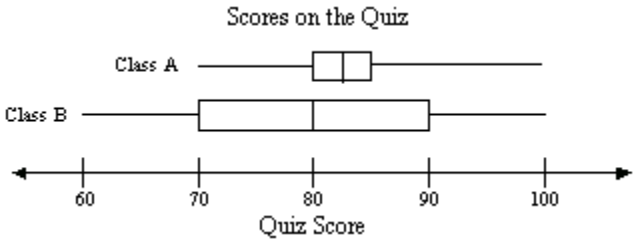


Sample correct answer:
Although the range of the Average Monthly Rainfall for the Wetland Region in Equatorial Africa is the same as the range for the ACT, 75% of the average monthly rainfall of the Wetland Region in Equatorial Africa is above 56.5, the median of the ACT. The second plot has its lower quartile at the same point of the median of the previous data set, reflecting wetter conditions. 50% of the average monthly rainfall of the Wetland Region in Equatorial Africa is above the upper quartile for the average monthly rainfall for the ACT. This means that half of the data values for the Wetland Region in Equatorial Africa are greater than the upper quartile of the ACT.

Sample Item #1 - Selected Response (SR) Item

Mathematics Grade 8 Objective 4.B.1.b

Ms. Smith gave a quiz last week. The results for two of her classes are shown on the box-and-whisker plots below.



Which sentence best describes the quiz results?

A. The medians for the two classes are the same.
B. Class A has a smaller range of scores in the upper quartile than Class B.
C. Class A performed better than Class B.
D. The lower extreme of Class B is greater than the lower extreme of Class A.

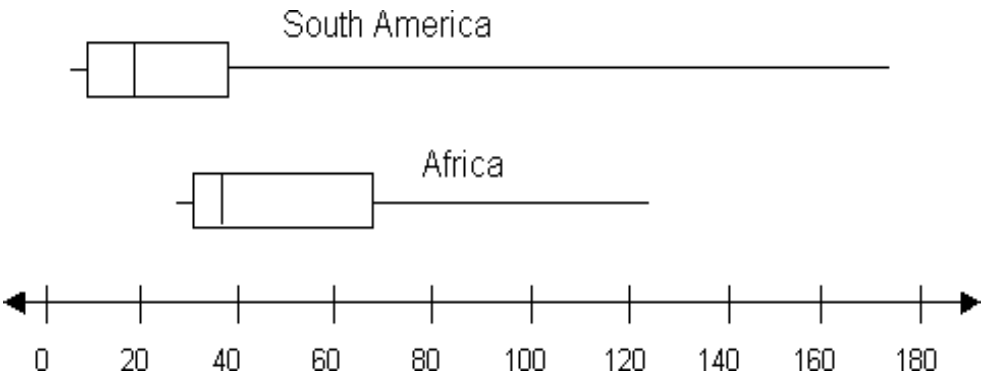
Correct Answer:
C

Sample Item #2 - Selected Response (SR) Item

Mathematics Grade 8 Objective 4.B.1.b

Look at the box-and-whisker plots below.

Populations of Countries in South America and Africa
(in millions of people)



(source: www.aneki.com)

What is the approximate difference between the lower and upper quartiles for South America?

A. 170
B. 100
C. 35
D. 30

Correct Answer:
D

Answer Annotation

A. 170 (175 – 5, this is the range)

B. 100 (125 – 25, this is the range for A)

C. 35 (65 – 30, this is the inter-quartile range for Africa)

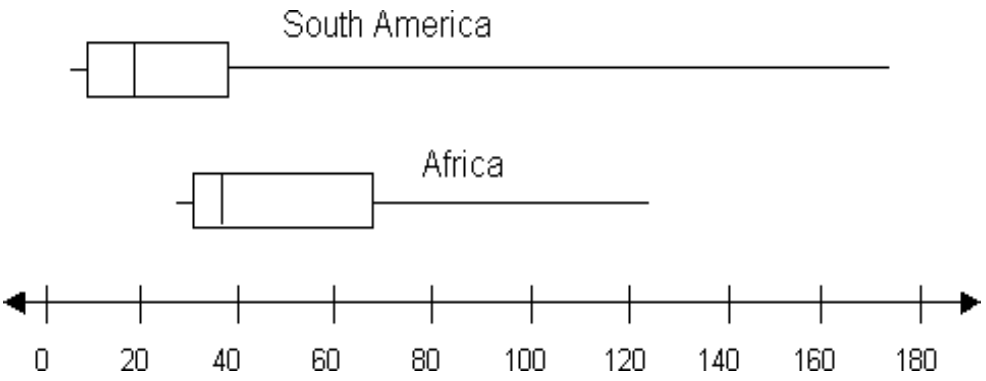
D. 30 (correct answer)

Sample Item #3 - Selected Response (SR) Item

Mathematics Grade 8 Objective 4.B.1.b

Look at the box-and-whisker plots below.

Populations of Countries in South America and Africa
(in millions of people)



(source: www.aneki.com)

Which statement is accurate based on the box-and-whisker plots?

A. The median population of the countries in Africa is less than the median population of the countries in South America.
B. The country with the greatest population in Africa has a greater population than the country with the greatest population in South America.
C. There are more people in Africa than in South America.
D. The lower quartile population of countries in Africa is greater than the median population of countries in South America. (correct answer)

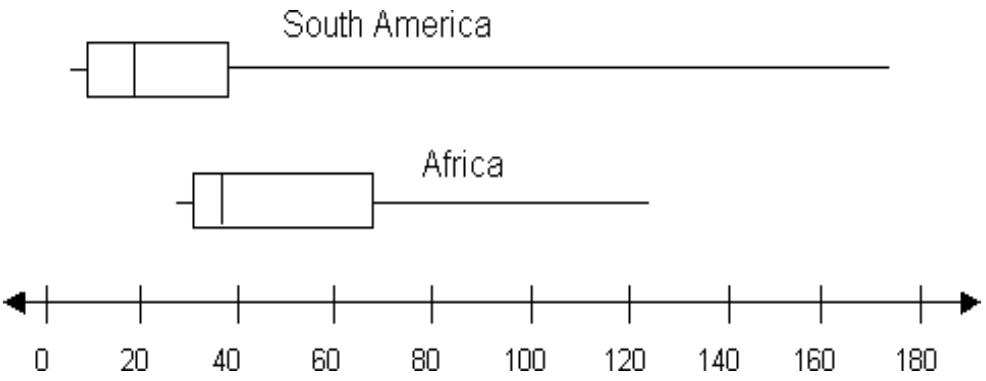
Correct Answer:
D

Sample Item #4 - Student Produced Response (SPR) Item

Mathematics Grade 8 Objective 4.B.1.b

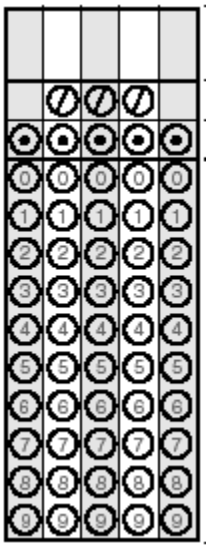
Look at the box-and-whisker plots below.

Populations of Countries in South America and Africa
(in millions of people)



(source: www.aneki.com)

What is the difference in the medians of the two data sets? (Note: 19±2 should be acceptable.)



Correct Answer:
19

Answer Annotation

Answer: or